Subject: IR Corrector Studies, Table attached
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Fulvia, Wolfram, Vadim,

I presented your results on IR corrector strength calculations at the CERN-KEK-US meeting earlier this week. A summary table showing the results, including the proposed corrector strength specifications in Tesla at 17 mm radius, is attached. The consensus conclusions were the following:

1) As a working hypothesis, we assume that the a5, b5 and a6 correctors can be eliminated.

2) With fewer correctors, the remaining layers should be regrouped into two packages as follows:
MCBX at Q3 contains b3 and b6 (no change)
MQSX at Q3 contains a3, a4 and b4
MCBX at Q2 contains no multipole windings

3) The corrector strengths will be set by the mean+3*sigma strength calculated from the IR Filter runs. The larger of the two values calculated over IP1/5 and IP2. The IP2 value is the larger in all cases except b6 (and a5, which, however, has been dropped). For all multipoles, mean+3*sigma is slightly larger than the maximum value over all seeds. This is deemed to be sufficiently conservative because:
a) Averages chosen for each seed are always at the mean + maximum of the uncertainty range.
b) The random errors in production are unlikely to be larger than in the error tables and may well be smaller.

4) Based on this, CERN will start to design the correction packages, with the maximum current being 120 A.

5) You are requested to do full 10^5 turn tracking studies with the reduced number of correction windings, placed at the new locations (only b4 among the remaining windings has moved). When setting corrector strengths for a given run, values should be truncated at the maximum design strength. If this reveals a limitation on the DA below the agreed upon values (>12 sigma mean, >10 sigma minimum), then we will need to understand which of the eliminated windings have to be added back.

A number of questions and suggestions for additional studies were raised:

1) Does the IR Filter program, which calculates the corrector strengths, consider feed-down due to off-axis beams? (I told the group I thought the answer is "no.") Do the tracking studies include a non-zero crossing angle? (Tanaji said he believes that they do.)

2) Since the errors in the superconducting D1 seem to be important, would the required corrector strengths be reduced if the lead end were oriented away from the IP in a region with smaller beta functions? Does this have any affect on the computed DA? (With improved error tables for the quadrupoles, the D1 should be relatively more important.)

3) If the DA is acceptable without a5, b5 and a6 correctors, can additional windings be eliminated?

Cheers,
Jim

KEK V4.0 FNAL V3.1

	Corrector Strength (units relative to MQX)										Strength@17mm (T) (G = 200 T/m)
	IP1 & IP5				IP2				Max(IP1/5, IP2)		
	mean				mean				mean		
Multipole	mean	σ	+ 3σ	max	mean	σ	+ 3σ	max	+ 3σ	max	
b3	8.3	6.9	28.9	28.4	16.2	12.5	53.7	50.6	53.7	50.6	0.018
b4	8.0	5.0	23.0	21.7	9.2	6.3	28.2	22.5	28.2	22.5	0.010 0.011[1]
b5	1.1	1.4	5.1	5.3	2.1	2.7	10.2	9.2	10.2	9.2	*0.003[2]*
b6	15.9	6.3	34.6	31.4	13.5	4.9	28.3	21.0	34.6	31.4	0.012
a3	14.4	11.2	47.9	44.5	34.2	14.3	77.2	63.3	77.2	63.3	0.026
a4	8.0	5.9	25.8	23.8	9.7	8.7	35.8	35.5	35.8	35.5	0.012
a5	1.8	1.4	6.1	5.5	1.5	1.1	4.6	3.5	6.1	5.5	*0.002[2]*
a6	1.6	1.3	5.4	6.5	3.2	1.9	8.7	7.3	8.7	7.3	*0.003[2]*

[1] Strength required if b4 winding is moved to the MQSX at Q3.

[2] It is proposed to eliminate these correctors (strength = 0).